

The Dipole Moments of Cyclohexanol and Cyclohexanone in Dioxane

By I. F. HALVERSTADT¹ AND W. D. KUMLER

In the course of an investigation on the structure of the bile acids it was desirable to know the dipole moments of cyclohexanol and cyclohexanone in dioxane. These compounds have been measured in benzene by Williams,² the moments being cyclohexanol, 1.9, and cyclohexanone 2.9.³

$$P_{E_2} = p_{20}M_2$$

$$\mu = 0.0127 \sqrt{(P_{20} - P_{E_2})T}$$

P_{E_2} values were calculated from the molar refractivities of the electron groups present in the molecules.

The $\epsilon_{12}-\omega_2$ curves were linear for both compounds and the extrapolated value of ϵ_1 was approximately equal to the observed value, indicating that the compounds are not associated in these solutions.

TABLE I
MEASUREMENTS IN DIOXANE AT 25°

Cyclohexanol			Cyclohexanone							
ω_2	ϵ_{12}	ϵ_{11}	ω_2	ϵ_{12}	ϵ_{11}	α	β	P_{20}	P_{E_2}	μ
0.002696	0.97424	2.2237	0.002580	0.97422	2.2395					
.005279	.97447	2.2337	.004785	.97448	2.2631					
.007566	.97476	2.2432	.008013	.97472	2.2972					
.010630	.97508	2.2554	.009462	.97491	2.3128					
.012633	.97524	2.2639	.011496	.97512	2.3342					
.014741	.97549	2.2723	.014441	.97546	2.3657					
	ϵ_1 measured	ϵ_1 extrapolated	ϵ_1 extrapolated							
Cyclohexanol	2.2123	2.2126	0.97395	4.05	0.104	97.8	29.2	1.82		
Cyclohexanone	2.2128	2.2121	0.97395	10.63	0.102	202.2	27.7	2.90		

The symbols in the equations and tables are the same as those given previously.⁴ The equations used in calculating the moments are⁴

$$p_{20} = \frac{3\alpha\epsilon_1}{(\epsilon_1 + 2)^2} + (\alpha + \beta) \frac{(\epsilon_1 - 1)}{(\epsilon_1 + 2)}$$

(1) Abraham Rosenberg Fellow in Pharmaceutical Chemistry 1941-1942.

(2) Williams, *THIS JOURNAL*, **52**, 1831 (1930).

(3) Through a typographical error, the moment of cyclohexanone is listed in William's article as 2.8.

(4) Halverstadt and Kumler, "A Critical Study of Dielectric Polarization Concentration Curves," in publication.

Eastman Kodak Co. practical cyclohexanol was dried over "Drierite" and twice fractionally distilled through a Widmer column, b. p. 160.9-161.3° cor. at 759 mm.

Eastman Kodak Co. practical cyclohexanone was twice fractionally distilled through a Widmer column, b. p. 157.0-157.5° cor. at 759 mm.

COLLEGE OF PHARMACY,
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO, CALIFORNIA

RECEIVED MAY 5, 1942

NEW BOOKS

The Tools of the Chemist. Their Ancestry and American Evolution. By ERNEST CHILD. Reinhold Publishing Corporation, New York, N. Y., 1940. 220 pp. Price, \$3.50.

"Tools of the Chemist," by Ernest Child is an historical account of the development of laboratory apparatus and ware with special emphasis on American enterprise. The book is divided into three parts. Part I, "People and Events in American Chemistry," is entirely historical and biographical and reviews the accomplishments of the pioneers of our science in this country. This part of the book is particularly valuable to the student of the history of chemistry and makes interesting and fascinating reading.

The major portion of the book, Part II, describes the "Ancestry and Development of American Chemical Laboratory Apparatus." In turn, the following appliances, ware and other materials are taken up: balances, glass, porcelain and silica ware, filter paper, heating apparatus, metal laboratory ware, platinum, alundum, rubber ware and optical apparatus. The section on balances is by far the best presented and is given in greatest detail, the illustrations being particularly well chosen to show the earlier forms. One is forcibly reminded throughout the reading of this section of the important and vital role the American chemist has had in developing and perfecting our modern chemical tools. More illustrations of present types of apparatus would have added interest to the book.